Sharing Personal Health and Fitness Data with Health Insurance Providers: An Empirical Study Considering Trust and Risk

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Abstract

Digital self-tracking with wearable devices and mobile applications is exceedingly popular. The arising data is not only crucial for individual use but also for actors in the healthcare segment. This paper focuses on German health insurance providers and their expanding call for clients' personal health and fitness data in a highly complex and regulated environment. As clients need to be willing to share health-related information, an experimental study was conducted, consisting of different modes of reward-based insurance offerings. Trust and perceived risk were assessed as prominent psychological constructs, assessing participants' willingness to share their personal information. Results show that examined factors such as company publicity or monetary incentives are scarcely influential. However, trust and perceived risk affect an individual's willingness to share. Taking up the health insurance provider's perspective, alternative aspects need to be considered to successfully gain consumer trust to collect the clients' health and fitness information.

1. Introduction

Whether it has been the invention of television sets or the broad and sudden availability of affordable washing machines – technology holds the potential to change numerous aspects of everyday life. The most recent growth area in the technological field is the ever-progressing smartness of devices produced for end customers in mass markets. Especially electronic gadgets with the purpose of measuring personal health and fitness activities have turned into a growing success [1, 2]. Smart watches and fitness bracelets, for example, are already functioning as everyday companions for over 17% of the German population. They, inter alia, measure sleeping cycles, fitness activities or eating habits. World leading electronic companies such as Apple or Samsung participate in the market segment of self-observation and optimization by not only providing smart phones but also smart wearable devices with integrated sensors.

The broad interest in digital self-observation inter alia originates from the *Quantified Self*[1] Community, which has been founded in the US in 2007. The main target is to generate meaningful insights about one's lifestyle by aggregating health and fitness data and statistically analyze and visualize them via mobile apps and statistical programs. This sort of information tends to be crucial not only for individual usage but also for parties belonging to the health sector.

For example, medical practitioners and research institutions already strive for the collection of fitness and health data to improve and simplify the prevention and treatment of chronic diseases or obesity [3]. This paper focuses on German health insurance providers and their expanding call for such data as it holds information about their clients' health statuses and lifestyles. By offering insurance programs in which a healthy lifestyle is rewarded with discounts or bonuses, several German public and private insurers have started to collect their clients' health and fitness data. Pioneering big players on the German health insurance market are the AOK, offering the '*AOK Bonus-App*' or the BARMER health insurance with the '*FIT2GO*' mobile application where fitness activities can be tracked and are rewarded accordingly.

However, the most important pre-requisite for the insurers' ability to collect and use self-tracking data is the clients' willingness to share the rather sensitive information. Therefore, this paper aims to assess how trust and perceived risk mediate links from typical incentives insurers offer (e.g., bonus for switching to data-related model) to an individual's willingness to conclude a health insurance contract that is based on sharing such personal health and fitness data. In the underlying empirical study, it is assumed that the willingness to share activity data is closely related to the concept of a purchase based on consumer decisions. As shown in existent research, trust and

[1] http://quantifiedself.com/ (Accessed: May 15th, 2019)

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perceived risk are often used as psychological constructs that impact an individual's purchasing decision [4, 5]. These studies mostly relate to the purchase of consumer goods [6], the use of e-commerce services [5] or other engagements in online transactions [7]. The willingness to interact with German health insurance companies by choosing a product based on activity data sharing has not been examined yet. Thus, besides investigating the effectiveness of incentive systems, this study targets to disclose similarities and differences in the concept of trust and perceived risk affecting customer behavior in the context of highly complex health insurance products in the German market.

Related studies also show that individuals are generally willing to share respective data with health practitioners and researchers for the greater good [6, 8, 9], but are skeptical with regards to insurance companies. From a German health insurance company's perspective, it is therefore valuable to know about the factors that potentially decrease their clients' perceived risk and support their trust when collecting personal health and fitness data. In e-commerce, for example, a professional web-design leads to an increase in trust and a lower perception of risk [4] whereas in retail, a brand needs to work on fulfilling the customer's technical needs with a product in order to maintain credibility and trust [10].

Also, relevant contextual background information is provided in the following section to develop the study's underlying hypotheses.

2. Theoretical background and hypotheses development

2.1. Germany's health insurance system

The German health insurance landscape holds distinctive characteristics that could potentially lead to a deviation in behavior when it comes to the willingness to share personal health and fitness data, especially in comparison to countries like the UK or South Africa where data sharing and incentive-based insurance programs have grown highly successful over the last decade [11].

The particularity to emphasize on is the dual system in Germany which offers private as well as politically regulated public health insurance. Over 70 million Germans (~90%) are publicly insured within the existing social security system, the rest takes up for private insurance [12]. This high number of insured citizens exists due to a legal health insurance obligation in Germany in effect since 2009 [13]. Public health insurance is based on the principles of solidarity, referring to the social equalization between socially weak and socially well situated individuals by law. [14] Compared to private insurance models, the premiums are based on income levels and not on the individual's age or assessed risks of suffering from health issues in the future. [15] In this model, individuals with a low income or even welfare recipients are guaranteed similar basic healthcare provision as the ones with high earnings. A potential threat to the solidarity principle is the significant annual increase in healthcare expenses mainly caused by demographic changes and cost intensive medical-technical progress [16].

Before 1996, it was not possible for German citizens to choose where to be health insured. Based on occupation or location, the provider was mainly obligatory [17]. Due to this obligation and missing competitive structures the variety of statutory providers added up to 960 in 1995 and has decreased to 110 in 2018, also due to mergers forming Germany's largest health insurance companies such as the AOK. Despite the establishment of free provider choice, a price competition as in private insurance models is still not possible due to legally standardized insurance premium proportions. However, providers are in a competitive environment when it comes to improving and offering additional services to increase the customer base and enhance satisfaction [18]. Also, insurers aim for a healthy client base since it results in decreased cost and increased profitability.

2.2. Status quo of mobile health in the German health insurance sector

German health insurers have started recently to promote mobile health applications with offerings of so-called pay-as-you-live components where benefits in exchange for the individual's self-tracking data are granted and healthy behavior is rewarded. Thereby, big data evolves and advanced analytics aid to provide a holistic picture of the client base that the insurer prefers to be fit rather than indolent [19]. Still, the widespread establishment of such insurance programs is still absent in Germany compared to other countries such as South Africa or the UK [20]. One of several reasons for this is the complex system where mobile health offerings need to meet numerous requirements and regulations [15]. Also, the digital availability of health-related data is not yet common in Germany [20]. Another reason is that the German medical care landscape is considered as excellent and therefore the pressure for preventive measures is not as high as in other countries yet [20].

2.3. Hypotheses development

Company Publicity, Trust and Perceived Risk. In Germany, health insurance providers engage in consumer-centered marketing activities to promote brand awareness in order to gain new clients and satisfy the old ones [21]. These reach from smaller print appearances over sophisticated TV campaigns to sponsorships of sports clubs, depending on company size and budget.

As brands become more prominent due to increased exposure, they are shown to be more likely to be favored as tried-and-trusted by consumers [22]. Also, threat feared by individuals is decreased as positive associations are manifested through familiarity [23]. Therefore, the company publicity should increase trust and lower perceived risk in scenarios of health-data-driven insurance models.

Hypothesis 1 (H1): Given that the provision of health and fitness data is part of the offered insurance type, it is assumed that the more publicly known the health insurance company is, (a) the higher is the trust and (b) the lower is the perceived risk.

Monetary Incentives, Trust and Perceived Risk. Monetary incentives are discussed controversially as proponents argue that financial rewards favor an anticipated behavior whereas opponents see desired behavior endangered due to a crowding-out effect, minimizing much needed intrinsic motivation [24]. The effect of incentives on behavior is shown to be context-dependent [25]. The focus for health insurers lies on incentivizing the formation of positive habits such as regular exercise or healthy eating to prevent obesity and diseases. An experiment conducted by Charness and Gneezy (2009), in which participants were financially rewarded to visit the gym regularly in a certain period, has resulted in an improved gym attendance rate during, and most importantly, after the experimental intervention [26]. Monetary incentives such as bonus payments or pay-as-you-live models could result in an increase of the desired healthy behavior. To reward healthy behavior, the provision of data in our model is a pre-requisite as they serve as proof for the health insurer of the clients' pursuit of an active lifestyle. Therefore, it is to be assessed whether monetary incentives lower the client's perceived risk and increase trust towards the health insurer to facilitate data sharing.

In analogy to existent research it can be assumed that individuals do perceive risk when considering the disclosure of personal health and fitness information but it is lowered by financial rewards [27]. The data disclosure can be viewed as an equal exchange of benefits that reduces potential privacy concerns [28]. It is also theorized that the insurer's benevolent intentions of promoting an active lifestyle by rewarding healthy behavior impact trust positively.

Hypothesis 2 (H2): Given that the provision of health and fitness data is part of the offered insurance type, the payment of an instant monetary bonus is assumed to (a) increase trust towards the health insurance company and (b) lower perceived risks.

Hypothesis 3 (H3): Given that the provision of health and fitness data is part of the offered insurance type, the existence of an incentive in form of a pay-as-you-live rate is assumed to (a) increase trust towards the health insurance company and (b) lower perceived risks.

Trust and its Impact on the Willingness to Share Health and Fitness Data. Research on trust as a human-centered social concept is conducted in almost every field, reaching from psychology and sociology to anthropology, computer sciences or economics [29]. Abundant definitions exist, a variety focusing on the explanation of trust-based human choice behavior such as consumer decisions [30]. The definitions share the common understanding that trust is based on relationships between two agents whereas one serves as a trustor needing to show trust towards a trustee [31]. In the context of this study, the health insurance provider is in the role of the trustee that needs to gain their clients' trust.

According to Luhman (1979), trust can be described as a heuristic mechanism used for complexity reduction. This refers to faster decision-making capabilities despite a lack of information in order to stabilize uncertainties [29, 32]. Trust governs exchange situations where risk and uncertainty are perceived, for example in social and business-related relations [33]. Zand (1972) defines trust as "[…] a psychological state comprising the intention to accept vulnerability based upon positive expectations of the intentions or behavior of another." [34] This is one alongside other expectancy trust related definitions. Here, trust is a mandatory concept underlying choice behavior that leads to an individual's willingness to take risks and be vulnerable based on words, actions or decisions of others that are expected to have a positive, unharmful outcome [30, 35–37].

Several models aim to operationalize the multi-dimensional trust construct. To measure consumer trust with regards to the underlying study, trusting beliefs are assessed based on an individual's perception of the competence, benevolence and integrity of a trustee [38]. Competence as one dimension describes a trustee's ability to do what a trustor needs, benevolence

assesses the motivation to act in a trustor's interest and integrity refers to expected honesty and promise keeping.
Trust is assumed as a pre-requisite for an individual's willingness to share personal health and fitness information with German health insurers.

Hypothesis 4 (H4): Trust (towards the health insurance company and / or the offered health insurance model) increases an individual's willingness to share personal health and fitness data.

Perceived Risk and its Impact on the Willingness to Share Health and Fitness Data. The purchase of a new car could potentially lead to a broken engine after only a short time of usage. The investment into stocks could result in the loss of money. Also, the disclosure of personal health and fitness information could lead to a loss in privacy. Every decision-based situation holds certain risks with unforeseeable future consequences. The multi-dimensional construct perceived risk describes the uncertainty faced by individuals that are unable to predict the consequences of their decisions [39], fearing unfavorable outcomes [40]. Perceived risk is shown to influence consumer behavior and decision making and is often researched in combination with trust [4, 5, 41]. Trust reduces complexity and uncertainty and can therefore decrease the perception of risk in a situation [35, 41]. As trust is required in every risky situation, models propose that the level of trust and the level of perceived risk interact and lead to risk taking behavior. Also, a trustor's existent level of trust towards an object or a trustee can be compared to the level of perceived risk. If trust exceeds perceived risk, the trustor performs the respective behavior and vice versa [42].

Hypothesis 5 (H5): The perception of risk (towards the health insurance company and / or the offered health insurance model) lowers an individual's willingness to share personal health and fitness data.

3. Method

3.1. Study design

Setup. To test the hypotheses, a between-subject experiment has been conducted in form of an online survey, which consisted of three sections. It was to be assessed by adult individuals that are health-insured in Germany. No other participation restrictions applied.

The first section consisted of control variables such as demographics as well as information viewed as relevant for the model (and for the dependent variables). In section two, the participants were asked to imagine a search for a new health insurance program and were then confronted with a press release containing an offering of such. The eight different scenarios of the 2x2x2 factorial design were randomly distributed and differed in the respective variations of the stimuli *Company Publicity* (CP; AOK (1) versus BIG (0)), *Bonus* (B; 100 Euro change bonus (1) versus no bonus (0)) and *Pay-as-you-live Points* (PLP; the option to earn points based on healthy living (1) versus no points (0)) (see Table 1). However, they all contained the highly relevant request for the participant to share personal health and fitness data with the insurance company.

After inspecting the press release, the participants were led to the third section of the questionnaire. This part contained the evaluation of the scenario regarding the participant's willingness to share personal health and fitness data. Trust and perceived risk were then measured by operationalized scales adapted by extant literature and modified to meet the study's needs.

Stimuli. The press release contained the logo of either the well-known (i.e. publicity, AOK) or unknown (i.e. fictitious, BIG) insurance company on header level to provide a realistic design as well as to manifest the insurance brand name. After this, it stated the provider's new release of a health insurance program focused on the transmission of personal health and fitness data. The second paragraph briefly explained the principle of the simple and direct transfer of data from a fitness tracking device or a connected mobile application, emphasizing the provision of a holistic lifestyle overview. Up to this point, the set-up of the different scenarios was similar except for the CP stimulus. The press release then contained either the PLP option - where points are collected for every transmitted activity and can later be exchanged into rewards such as money or gifts – or no such option. The last component, if applicable in the respective scenario, is the instant bonus payment of 100€ for concluding a contract with the mentioned provider. With this procedure, eight different scenario groups had been built.

The target was a realistic set-up of a health and fitness data centric insurance model where (monetary) incentives play an essential role. Especially the PLP component is offered by several German health insurers already. Although an instant monetary bonus for concluding a contract is not common in the German health insurance system, it is supposed to emphasize and intensify the monetary incentive for sharing personal health and fitness data in this model.

3.2. Measures

Willingness to Share Personal Health and Fitness Data. After the assessment of the press release, participants were asked to evaluate the likelihood of sharing personal health and fitness data with the considered health insurance company (i.e. willingness to share data, WTS). An 11-point Juster probability scale was used [43]. Insurance products are perceived as complex [44] and it is assumed that no definite estimation of future behavior can be provided by participants. Therefore, only the chances of future engagement are requested. Prior studies show that probability measures achieve higher correlations with actual forthcoming behavior [45].

Table 1. Experimental stimuli (2x2x2 factorial design)

Stimulus	*Variants*	
Company Publicity *(CP)*	*Well-known (1)* - The AOK health insurance (founded in 1884) holds ~36% of the German market share with ~26 million members[2] - In 2017 the AOK brand recognition scored 78%[3]	*Fictious (0)* - The BIG health insurance, founded in 1996, counts only ~300.000 members [4]
Bonus *(B)*	*yes (1)* - 100€ bonus for concluding a contract	*No (0)*
Pay-as-you-live Points *(PLP)*	*yes (1)* - Collection of bonus points for each transmitted activity that can be exchanged into monetary / non-monetary rewards (e.g. running shoes)	*No (0)*

[2] https://www.aok.de/inhalt/wir-ueber-uns-die-aok/ (company own information) (Accessed: August, 30th, 2019)

[3] https://de.statista.com/statistik/daten/studie/661751/umfrage/umfrage-zur-bekanntheit-von-krankenkassen-in-deutschland/ (Accessed: August, 30th, 2019)

[4] https://krankenkassen.net/gesetzliche-krankenversicherung/mitgliederzahlen-der-gesetzlichen-krankenkassen.html (status 2016) (Accessed: August, 30th, 2019)

Trust (T). Trust as a social construction was examined by measuring (1) benevolent trust, (2) competency trust as well as (3) integrity with regards to the participant's beliefs about the respective health insurance company and its offering. The construct was operationalized based on extant literature [46]. All items were measured on a 7-point Likert scale and all three subscales were merged into one value to reflect trust.

Perceived Risk (PR). The participants were asked about the perceived (1) psychological risk, (2) privacy risk and (3) financial risk. The holistic construct of perceived risk was as well operationalized based on scales of extant literature [47]. All items were measured on a 7-point Likert scale. Again, all subscales were merged into one value for perceived risk.

Control Variables. The questionnaire also collected demographic data, asking for gender, age, highest educational qualification, current occupational status and income.

Besides that, several topic-related measures were considered. The weekly amount of fitness activity was requested by the participants, assuming that active individuals are more likely to receive rewards when sharing their information. Another question asked the participants for their actual experience with recording personal health and fitness data, providing a dichotomous *yes* or *no* response option ("Have you ever or do you currently track your fitness status with a digital device?"). Of interest was also the health insurance type *public*, *private* or *non-existent* since German health insurance mechanisms differ as explained in the previous chapter. The participants were also asked for the number of previous health insurance changes as it is assumed to give an indication of the general willingness to switch providers. The last control variable was a request for an estimate of the number of doctor visits in the previous year. This follows the assumption that individuals suffering from health conditions are likely to visit the doctor's office more often and therefore do not benefit from health insurance rewards offered in the model.

3.3. Sample

The questionnaire was issued on the crowd intelligence platform clickworker.de, providing an incentive of 0.70€ for participation. Overall, valid and fully completed data sets of 238 participants were analyzed. The sample was quite gender-balanced with 116 male (48.7%) and 122 female participants. The mean age lies at 39.6 years and is therefore slightly below the German average of 44.25 years.

An equally distributed sample of individuals that are either privately (17.6%) or publicly (82.4%) health insured in Germany has been retrieved. Due to the legal requirement of having to be health insured in Germany there was no participant without an insurance. The majority of 49.2% of participants stated to never have changed their health insurance before, allowing the assumption of a rather low change readiness. With regards to doctor visits in the previous year, the average number of visits reported by participants lies between two to five, a majority of 34% stated three to five visits. This is below the reported German average of 10 annual doctor visits per person [48]. Besides the possibility of a healthy participant base in this study, it can also be assumed that asking about doctor visits is a highly personal topic which some might have difficulties to answer.

41.6% of the participants are currently or have been recording their fitness activities with a wearable device or a mobile application and are therefore considered experienced with the procedures of digitally collecting and transmitting personal health and fitness data. Asked about weekly fitness activities, the majority of participants (46%) stated to be active one to two times per week, 20.6% responded to not be active at all. 34% engage in physical activity on three or more days, finding only a small number of individuals being active daily. This resembles existing statistics about fitness activity in Germany.

4. Findings

4.1. Preliminary factor analysis

An initial factor analysis was conducted to test the constructs reliability. Initially, trust and risk were conceptualized as higher order constructs; trust as consisting of benevolence, competence, and integrity as dimensions, and risk as consisting of psychological, privacy, and financial aspects. As it is often the case for higher order constructs, an exploratory factor analyses with Varimax rotation revealed that some minor cross loadings exist. To this end, we combined all indicators for risk and all indicators for trust into one construct each. Cronbach's Alpha for trust was 0.91 and 0.90 for risk. An exploratory factor analysis that was forced to end with exactly two factors revealed that no substantial cross loading exists; making trust and risk reliable indicators of what they should measure.

4.2. Hypotheses testing

Effects on T and PR. A multiple regression analysis was conducted to test the hypotheses (see Table 2). Model 1 and 2 examine the relation between the stimuli and the mediating factors T and PR. Also, relevant control variables and their influence on T and PR were tested. The explained variance in the dependent variable of $R^2 = 0.12$ applies for both models.

The stimuli barely influence T and PR. CP ($b = 0.26$, $p < 0.1$) positively affects T when taking a significance level of $p < 0.1$ into account (Model 1). This shows that when the company's publicity is higher, the trust increases as well. Therefore, H1a is supported. Also, PLP (i.e. the existence of the possibility to earn pay as you live points) negatively affects PR ($b = -0.41$, $p < 0.05$). Thus, the existence of a monetary incentive in form of pay-as-you-live points lowers the perceived risk, which confirms H3b. Besides these two findings, *H1-H3* seem to large extent not supported by the model's outcome. However, it is visible that T and PR show statistical differences as PLP negatively influences PR, but has no positive significant influence on T.

Another finding is that the number of annual doctor visits impacts T and PR, negatively influencing T ($b = -0.09$, $p < 0.05$) and positively influencing PR ($b = 0.10$, $p < 0.10$). More frequent health practitioner visits lower trust towards the respective health insurance provider and increase the perceived risk regarding such. This could either show that less healthy individuals take advantage of health insurance services more often and are therefore not expecting to benefit from rewards of a healthy lifestyle. Another way to interpret this result is to assume that the possibility of negative experiences with health insurance companies is more likely when taking advantage of their services more often. Therefore, the trust towards health insurers serving as service providers could have been lowered and the perception of risk increased due to dissatisfaction.

Highly significant is the impact of experience with recording fitness and health data. Existing experience negatively influences T ($b = -0.56$, $p < 0.001$) and positively affects PR ($b = 0.54$, $p < 0.001$). Being knowledgeable about insights that fitness and health data provide, it is possible that participants in possession of experience show higher awareness concerning data sharing and privacy concerns.

Effects on WTS. Model 3 examines the effects on the participants' willingness to share personal health and fitness data with the considered health insurer. 60% of variance can be explained by model 3 ($R^2 = 0.60$).

Considering the stimuli *CP, B* and *PLP*, only *CP* shows slight significance and negatively influences WTS (b = -0.51, p < 0.10). However, model 3 fully supports H3 and H4 by showing that PR negatively affects WTS (b = -1.12, p < 0.001) and T positively influences WTS (b = 0.45, p < 0.01).
The assessment of the control variables' impact show that fitness activity positively affects WTS (β = 0.28, p < 0.05). Activity data recording experience has a negative impact on WTS (β = -1.28, p < 0.001), in analogy to the impact on T and PR.

Table 2. Multiple Regression Analysis

	Model 1 **Trust**	*Model 2* **Risk**	*Model 3* **WTS**
IV			
Company Publicity (CP)	.26 (.14)$^{+}$	-.04 (.16)	-.51 (.27)$^{+}$
Bonus (B)	-.18 (.13)	-.12 (.16)	-.18 (.26)
Pay-as-you-live Points (PLP)	-.09 (.14)	-.41 (.16)*	.26 (.27)
Mediator			
Perceived Risk (PR)			-1.12 (.13)***
Trust (T)			.45 (.15)**
Controls			
Age	-.00 (.01)	.01 (.01)	-.01 (.01)
Gender	-.02 (.14)	.21 (.16)	-.06 (.26)
Income	03 (.04)	-.04 (.05)	.08 (.08)
Fitness Activity	.02 (.07)	-.07 (.08)	.28 (.14)*
Doctor Visits / Year	-.09 (.05)*	.10 (.05)$^{+}$	-.09 (.09)
Insurance (private / public)	.02 (.18)	.11 (.21)	.06 (.36)
Activity Data Recording Experience (y/n)	-.56 (.15)***	.54 (.17)***	-1.28 (.29)***
R^2	.12	.12	.60
N	238	238	238

*** p < 0.001, ** p < 0.01, * p < 0.05, $^{+}$p < 0.10; unstandardized coefficients

5. Conclusion and future research

The purpose of this study was to gain insights about aspects that German health insurance companies need to consider to successfully gather their clients' personal health and fitness data by increasing trust and decreasing perceived risks. To this end, scenarios were evaluated which all contained a pay-as-you-live tariff, but for which different incentive schemes were available. Taking up the providers' perspective, an important finding is that their clients are barely influenced by factors such as company publicity or monetary incentives. This leads to the supposition that mechanisms applying in this sector do not resemble other areas where consumer decisions are made.

Still, trust and perceived risk are shown to influence an individual's willingness to share personal health and fitness data, but they are barely influenced by the experimental stimuli. Therefore, it is recommended to focus on additional impacting factors such as data privacy, guaranteed anonymity or higher transparency when conducting further related research. Also, the quality of data originating from wearable devices can be considered.

The results show that an increased activity level increases an individual's willingness to provide personal data and this can be based on the person's knowledge about benefitting from such insurance models. Voluntary data exposure is feared to lead to a discrimination of those not willing to share information as it could be assumed that a) they might have something to hide or b) they are pursuing an unhealthy lifestyle.

Reward and incentive-based insurance programs with a fitness and health data sharing component are successful in other countries such as South Africa or the UK. *Vitality*, the pioneering insurance model offered by the private health insurance company Discovery [49], for example, rewards customers for a healthy lifestyle manifested by fitness activities and the purchase of healthy foods. The company calls it a Shared-Value Insurance Approach and emphasizes a win-win-win situation where a) the client benefits from an improved health status and is monetarily incentivized, b) the insurer reaches higher margins and faces less claims and c) the society becomes holistically healthier [50]. In this study, it is assumed that the influence of the complex German health insurance system and the existing solidarity principles do not result in outcomes transferable to other regions. Therefore, a comparison between countries and health insurance systems is proposed for future research to find out about the distinctive characteristics responsible for this study's results. Related to this, potential discrepancies between privately insured and publicly insured German citizens can be examined as well.

The increasing cost in German healthcare requires a mindset that promotes prevention of diseases instead of only curing them. Mobile technologies can support self-awareness and the enhancement of healthy habits. Health insurers face the future challenge of being perceived as a partner in health prevention by gaining

their clients' trust and lowering risk perceptions. This applies especially for the application of mobile health solutions as their importance tends to grow.

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